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A CONTRIBUTION TO THE STUDY OF ULCERATIVE ENDOCARDITIS.

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IT is the writer's intention in this article to give a short *résumé* of the history of ulcerative endocarditis, the pathological anatomy of the disease, and the etiological factors, together with a short synopsis of thirty-two cases.

In the recapitulation the writer takes up the varieties of the disease, with the principal symptoms as found in his collection.

The names of Bouillard and Stenhouse Kirkes are prominent among those who first recognized that there is a form of endocarditis more malignant in its course and termination than the simple acute variety.

Virchow first showed the embolic nature of the plugs occurring in the arteries.

Winge was the first, however, to describe microbes found on the valves and in the metastatic infarcts; these he described as chains of small rods or of small round granules.

Heilberg also found organisms of a similar character in a case of endocarditis in a puerperal state; he excised particles of the valves and injected them into rabbits, but without effect. Numerous inoculation experiments followed, and Birch-Hirschfeld succeeded in causing panophthalmitis in three rabbits by inoculation with fragments of valve deposits.

From 1885 to 1888 numerous interesting observations were published, most important of them being those of Netter, Weichselbaum, Orth, Wyssokowitsch, and Rosenbach. The investigations showed that by injecting into the external jugular vein pyogenic organisms, as streptococcus pyogenes, staphylococcus pyogenes aureus, and others, an artificial endocarditis could be produced. The experiments were more apt to be successful if the valves or arterial surfaces were injured before the introduction of the germs; the injury being caused by a sterilized stylet passed through the carotid artery into the left ventricle (Rosenbach). However, Dreschfeld has succeeded in producing the disease without previously wounding the valves. The resulting organisms were found on the valve surface and in the metastatic emboli.

Most recent investigators are of the opinion that the difference between *simple acute* and *ulcerative* endocarditis is one of degree, depending upon the virulence of the invading organisms or their toxins, or susceptibility on the part of the patient. Bacteria are found in the valves of both forms; almost *always* in the ulcerative variety, *often* in the simple form, and the same organisms are found in both. According to Weichselbaum, "acute endocarditis chiefly affects the valves, especially of the left heart, and appears to be practically always due to bacteria; the micro-organisms affect the valves either primarily or are derived from other organs. An anatomical distinction between ulcerative and verrucose forms can be drawn only according to the *destructive* character of the inflammation. The difference is entirely one of degree, dependent upon the quantity and the virulence of the bacteria. In the *ulcerative* variety the *necrotic destruction and the surrounding inflammation* is much more extensive than in the other, and leads to the formation of ulcers, erosion, miliary aneurysms, and perforation of the valves." Dawson Williams thinks that when the right heart is attacked it is by secondary infection.

Harbitz records 39 cases which he considers of the infectious type. In 6 cases the ulcerations had healed and presented outgrowths on the endocardium; at the edges of the vegetations masses of bacteria were aggregated, but cultures remained sterile. He makes two classifications pathologically—one with vegetations and excrescences on the endocardium, the other with destruction of tissue ulceration. Osler says that in 75 per cent. of cases the infectious form is engrafted upon a previous endocarditis. In his collection of 209 cases the tricuspid valve was involved alone in 19, the pulmonary in 15, aortic alone in 55, mitral alone in 17, aortic and mitral together in 41, heart walls in 33, and the right heart alone in 9.

Jackson reports 59 cases, with autopsies in 43. The mitral valve alone was affected in 15, the aortic in 9, both together in 10, and the right heart showed lesions in 6 cases. Small abscesses of the brain and purulent meningitis were often seen, and organisms resembling cocci morphologically were frequently found in sections of the endocardium.

In 44 cases of the ulcerative type reported by Thayer and Lazear the right heart was affected in 15.91 per cent.

Out of 802 *benign* cases in the Münich statistics the right heart alone was affected in 3.25 per cent.[1]

The *organisms* most frequently found are the streptococcus pyogenes, staphylococcus pyogenes albus and aureus, pneumococcus of Fraenkel, or diplococcus lanceolatus; less frequently the gonococcus, typhoid bacillus, bacillus of tuberculosis, bacillus of diphtheria, and the colon bacillus. Streptococcus pyogenes and staphylococcus pyogenes aureus are found in cases in which the endocarditis is apparently primary; in septic and pyæmic conditions, as wounds, abscesses, the puerperal state, erysipelas, etc.; in cases where there is a pre-existing valvular lesion, due to previous rheumatic disease. These two organisms have also been found upon the valves in cases complicating typhoid fever, gonorrhœa, diphtheria, etc., as showing a type of mixed infection. The diplococcus lanceolatus has been found mostly where croupous pneumonia or meningitis has been present, although two cases are cited in this series where neither lesion existed, but a previous endocarditis had occurred.

Blood cultures were taken in 23 of Jackson's 59 cases; streptococcus was found in 8, micrococcus lanceolatus in 5, staphylococcus in 3, colon in 1, streptococcus and staphylococcus together in 1, and streptococcus with unknown organisms in 1.

Of the writer's cases staphylococcus was found in 4, micrococcus lanceolatus in 3, staphylococcus and pneumococcus together in 1, streptococcus in 2 cases.

. According to Dreschfeld "the following types of malignant endocarditis are recognized: (*a*) primary; (*b*) as a complication of septic diseases; (*c*) as a complication of pneumonia and meningitis; (*d*) as a mixed infection secondary to the acute infectious fevers, to rheumatic endocarditis, or to a sclerosis of the valves."

The primary cases are admittedly rare. Pneumonia is a frequent cause, as is meningitis, also septicæmia from whatever origin; rheumatic fever, and less frequently typhoid fever, influenza, diphtheria, scarlet fever, tuberculosis, variola, and measles,.

Of the writer's 32 cases 8 occurred coincidently with rheumatism, 1 apparently with a strain of the back accompanied by hæmaturia, 7 gave a history of old rheumatic attacks, 3 of having had scarlet fever or diphtheria. 2 of palpitation and dyspnœa, 7 of typhoid fever, influenza, or malaria, the remainder having apparently always been well.

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[1] In looking up the records of cases of *simple* mitral stenosis the writer has collected 50 cases, in which 12 (24 per cent.) showed lesions of the tricuspid valve. These give the largest percentage of right heart inflammation he has yet seen (report of the Cornell University Dispensary, 1904).

The disease is rare among young children. Osler gives but 3 cases in his collection of 109. The records of the Children's Hospital at Melbourne furnish but 1 case in ten years. Davies finds but 1 case in the *Transactions of the Pathological Society* (London). Only 1 case appears in the records of the London Hospital for Sick Children from 1870 to 1890, and S. S. Adams reports but 1 case in the Children's Hospital, Washington, D. C., since 1870.

S. S. Adams has collected all the cases reported in children under fifteen years of age—46 in all—3 congenital, 1 of eight months, 1 of ten months, 1 of eleven months, 3 of three years, 2 of four years, 3 of five and a half years, 2 of six years, and the others of seven and over. The diseases preceding or accompanying this condition were: maternal erysipelas and fetal infection (cultures from the cord showed streptococci); malaria, 1 (æstivo-autumnal); acute miliary tuberculosis, 1; vaginitis, 1; remitting fever, 1; rheumatism, 3; chorea, 2; rheumatism and chorea, 1; typhoid fever, 2; empyema, 1; trauma, 1; otitis media, 1; old cardiac disease, 5; caseous tubercle, 1; diphtheria, 1; influenza, 2; erysipelas, 1; tonsillitis, 1. The rest are not given.

Of the 46 cases, the heart wall was affected in 6, the tricuspid valve in 5, the pulmonary valve in 2; one had a patent foramen ovale, and in the others the left heart was the seat of inflammation.

No cases have occurred in young children in the Presbyterian Hospital during the last ten years.

GROUP I.

The following collection of cases is one in which the staphylococcus pyogenes aureus was found. The albus, which was obtained in a number of cases, is considered only as a skin contamination.

CASE I.—Aged thirty-seven years, male, attendant, admitted February 3, 1900; died February 9, 1900. Two of the family died of pulmonary tuberculosis. The patient drank moderately, but never had syphilis or rheumatism.

The present illness began one week before admission with the sudden vomiting of about a pint of blood, followed by a pain over both hypochondriac regions. Three days later he had retention of urine.

The *physical examination* upon admission showed nothing, but the following day the temperature began to rise irregularly, reaching 107° on the third day, continuing on the fourth day, and then falling slowly to 103°. During this time he developed a pericardial friction sound. The second day he had three convulsions, with great increase in arterial tension. Examination of the urine showed 15 per cent. of albumin (by volume), hyaline and granular casts, and red blood cells. Symptoms of meningitis soon followed, with headache, violent delirium, retraction of the head, rigidity of the muscles of the neck, back, and extremities, and general hyperæsthesia. Blood culture proved a pure growth of staphylococcus pyogenes aureus. There were no petechial hemorrhages, no chills; there was no splenic enlargement, nor any reaction to Widal test.

Upon *autopsy* the heart weighed nine and one-half ounces; the pericardium was normal, but the mitral valve showed small, white, soft, vegetations; the spleen and the kidneys were apparently normal.

Cultures from the spleen and brain showed staphylococcus pyogenes aureus.

CASE II.—Aged twenty-five years, housewife; admitted May 7, 1899; died May 9, 1899.

There was no family or previous history of note, with the exception of an attack of rheumatism fourteen months before admission. Dating from this, however, the patient had attacks of cardiac palpitation and dyspnœa.

The present illness began five days before admission, with sudden vomiting, dizziness, and high fever, preceded by dull pain in the joints. Two days after this a bright-red eruption occurred on her feet and legs, accompanied by severe epistaxis.

The *physical examination* showed evidence of mitral insufficiency; the presence of a rather profuse hemorrhagic eruption, and marked delirium. The temperature was 106°, pulse 120. After admission the temperature continued high. The blood showed 19,000 leukocytes per c.mm. Culture gave an abundant growth of staphylococcus pyogenes aureus. There were no chills, no splenic enlargement, and no reaction to Widal test. Autopsy could not be obtained.

CASE III.—Aged eighteen years, housewife; admitted February 17, 1902; died February 21, 1902.

The patient was a premature child, and while young had scarlet fever, diphtheria, acute articular rheumatism, and typhoid fever. She had frequent attacks of cardiac palpitation and dyspnœa, and during her pregnancies was uræmic; she was not alcoholic, but was a confirmed tea drinker. For eleven weeks previous to admission she was short of breath, had dyspnœa and palpitation, nausea, occasional vomiting, and diarrhœa.

Examination revealed a dilated heart, in which evidence of mitral and tricuspid incompetency existed; there was subcutaneous œdema, and dropsy of the serous cavities. The liver and spleen were both palpable. The course of the temperature was from 103° to 104°, and continuous. The blood examination revealed 37,000 leukocytes to the cubic millimeter, and the presenee of staphylococcus pyogenes aureus; there was no reaction to Widal test. The urine contained a trace of albumin and much blood. There were no subcutaneous hemorrhages.

CASE IV.—Aged thirty-six years, male, butcher; admitted October 31, 1901; died November 14, 1901.

Family history was unimportant. The patient had rheumatism of the subacute variety at twenty-five years of age, and gonorrhœa four years ago. For four months before admission he felt languid and listless, with dyspnœa, dry cough, precordial pain; at two different periods he had profuse hemorrhagic eruptions.

Upon *physical examination* mitral, systolic, and aortic diastolic murmurs were heard; the heart was enlarged, and compensation had broken. The liver could be felt three inches below the costal margin. The spleen was enlarged. After admission petechial hemorrhages developed. The temperature was irregular and not higher than 101°, the pulse 168. Leukocytes, 27,000 per c.mm.; hæmoglobin, 85 per cent. A growth of staphylococcus pyogenes aureus was obtained upon culture. No autopsy was granted.

GROUP II.

The following cases constitute a group in which the infection is by the micrococcus lanceolatus. The first two cases were reported by Dr. Walter B. James in the *Presbyterian Hospital Report* of 1898, and are here entered through his courtesy. It is of interest to note that none of them were accompanied by pulmonary complications.

CASE V.—Aged nineteen years, German; admitted May 1, 1887; died May 28, 1887.

There was no family or previous history of note. The present trouble began three months before admission, with a mild attack of inflammatory rheumatsim. The patient was told at that time she had organic heart disease. Anæmia, dyspnœa, and cardiac palpitation were the chief complaints. Two days before admission she suddenly lost the power in her right arm and leg, with complete aphasia.

Physical examination showed mental apathy; an irregular heart with a loud mitral systolic murmur heard in the axilla and over the back. The spleen percussed large, but could not be felt. There was great hypersensitiveness of the trunk and of the extremities, especially on the right side, with paralysis of that side.

The course of the temperature curve was irregular, and ranged between 101° and 105°. The leukocytes showed an increase to 14,000 per c.mm., later falling to 10,000; there were 1,806,000 red blood cells, and 43 per cent. hæmoglobin. A culture from the blood showed micrococcus lanceolatus. Examination of the urine gave 6 per cent. of albumin (by volume), no casts. She passed from fourteen to twenty ounces during the twenty-four hours.

Upon *autopsy* the heart was found to weigh fourteen ounces; upon the mitral valve, extending to the anterior surface of the auricle, and also into the ventricle, was a large patch of vegetation, rough and ragged, but not ulcerated; the heart muscle was mottled with pale areas. The spleen was swollen and soft, with numerous white infarctions The kidneys showed septic infarction. Of cultures taken from the spleen, liver, and kidneys, those from the first two organs showed abundant growths.

CASE VI.—Aged twenty-two years, female; book-keeper; admitted July 10, 1897; discharged August 18, 1897.

There was no family history. The patient had scarlet fever and mild rheumatism as a child. For the past two months she was anæmic and did not menstruate, although not pregnant. One month before admission mild rheumatic pains again appeared, soon followed by a sudden retinal hemorrhage. At the age of fifteen years she was told of the presence of a heart murmur.

Examination showed a pronounced thrill at the apex of the heart, with presystolic and systolic murmurs over the same area. The spleen was enlarged, urine normal.

The course of the temperature continued low and irregular, not going above 102°. The blood showed 10,000 leukocytes per c.mm. Culture gave a profuse growth of micrococcus lanceolatus; petechial hemorrhages developed with sharp pain, severe and sudden, over the region of the spleen, blindness in both eyes, and left hemiplegia, in which condition she died.

CASE VII.—Aged twenty-seven years, German, male; admitted April 1, 1903; died April 3, 1903.

For two months past the patient has been feeling weak and languid; four weeks before admission he was struck violently on the head; following this injury he felt chilly and feverish, had headache, earache, and at the time of admission he was delirious. Upon *examination* his neck was stiff and rigid, and painful upon motion; his extremities were rigid and painful also. Over the mitral area a systolic thrill and murmur were appreciable. The temperature continued high, 104°. There was no splenic tumor; there were no chills. Blood examination revealed micrococcus lanceolatus; the leukocytes were 9000 per c.mm. There was no Widal reaction.

At *autopsy* the mitral valve showed two large vegetations, a cyst on one segment and perforation of another. Under the pia and arachnoid, especially around the cerebellum, was a layer of greenish pus.

GROUP III. *A Case of Mixed Infection.*

CASE VIII.—Aged forty-four years, housewife; admitted January 18, 1902; died January 28, 1902.

The patient was a moderate alcoholic. The present illness began eight days before admission, with severe and protracted headache; three days before admission a hard, shaking chill occurred, followed by fever and sweating and increased prostration.

Physical examination showed marked conjunctivitis and rhinitis, prostration, and rigidity of the neck. The cardiac impulse was in the seventh space, and a mitral systolic murmur was evident. The spleen was enlarged. Lobar pneumonia soon developed. There were 21,000 leukocytes per c.mm. Culture from the blood showed growths of micrococcus lanceolatus and staphylococcus pyogenes aureus. Culture from the nose showed micrococcus lanceolatus, and one from the eyes showed staphylococcus. The temperature was fairly continuous from 103° to 104°, with frequent rises accompanied by chills. Upon lumbar puncture 23 c.cm. of cloudy fluid was obtained, from which smears were made, showing cocci arranged in pairs. The urine contained 4 per cent. of albumin, numerous hyaline and granular casts, and pus.

Upon *autopsy* a mass of polypoid vegetations was found on the mitral valve. The lungs contained a number of minute purulent nodules. The spleen showed numerous infarctions. A layer of pus covered the base of the brain; the ventricles contained turbid serum; the right lateral sinus and the right cavernous sinus were filled with clot. The ethmoidal and sphenoidal sinuses were eroded and filled with pus. The entire cord was bathed in creamy pus.

GROUP IV.

The following cases are of streptococcus origin:

CASE IX.—Aged twelve years, female; admitted November 28, 1902; died December 2, 1902.

The patient had no previous illness of note. For the past four weeks she suffered from headache, pains in the back, languor, nose-bleed, irregular fever, indefinite chills, with sweating and vomiting; of late she had diarrhœa.

On *examination* the cardiac impulse was found in the anterior axillary line, and a loud systolic murmur heard over the entire left anterior chest, axilla, and back. The spleen was enlarged, urine normal, no eruption. The course of the temperature was irregular, from 101° to 105°, but there were no chills. There were 14,000 leukocytes per c.mm., and streptococcus pyogenes was found upon blood culture. No malarial organisms were found. The child became semicomatose and developed a right hemiplegia. No autopsy could be obtained.

CASE X.—Aged twenty-four years, housewife; admitted August 12, 1897; died August 18, 1897.

There was a moderate alcoholic history. Eight days before admission and during her menstrual period the patient ate some indigestible food. She had pain in the abdomen, with vomiting, diarrhœa, and headache. She has vomited every day, and at one time the vomitus contained a little blood. She has had chilly sensations every day.

On *admission* there was a harsh mitral systolic murmur. Spleen not palpable. A few hemorrhagic spots were present. The temperature was enteric in character and continued at 105°. Leukocytes, 17,000 per c.mm.; no reaction to Widal test. Blood culture gave a growth of streptococcus pyogenes.

Autopsy revealed minute vegetations on aortic valve, and considerable mass of fibrin on the mitral, one cup being eroded and perforated. The heart muscle showed infarcts, as did the spleen and left kidney. The brain contained a blood clot as large as an egg in the right occipital lobe.

GROUP V.

The following are cases in which blood cultures failed to give results, and diagnosis rests upon pathological findings or clinical signs. Some of the cases occurred when the means of culture were not as perfect as at present, and some even before cultures came into general use.

CASE XI.—Aged thirty-six years, female. Old malarial and rheumatic history; rheumatic arthritis, with chills and fever for seven weeks before admission. Splenic tumor, high remittent temperature, with chills; 10,000 leukocytes. Mitral, systolic, and presystolic and aortic diastolic murmurs present.

Upon *autopsy* one cusp of the aortic valve was hypertrophied and polypoid; there was cerebral embolism.

CASE XII.—Aged forty-two years, female; history of œdema of extremities, and dyspnœa for years. Present attack of ten days' duration; temperature high and continuous; leukocytes, 27,000; no spleen, no chills, no cutaneous hemorrhages. There were mitral, systolic, and presystolic murmurs.

Autopsy showed thickening of the mitral and aortic valves, atheroma of the coronary arteries, and infarcts of the lung.

CASE XIII.—Aged forty-four years, male; scarlet fever, diphtheria, malaria, and nephritis formerly; alcoholic and gonorrhœal history. Present attack of ten days' duration, with strain of the back and hæmaturia. Temperature was high, but irregular, with chills; there were petechial hemorrhages, but no spleen; leukocytes, 12,000; the urine contained a trace of albumin and a few casts. Physical examination showed a double murmur at the apex.

Autopsy revealed large vegetation on the aortic valve, and infarcts of both kidneys.

CASE XIV.—Aged twenty-five years, male. Former malarial and gonorrhœal history. For six weeks before admission there was irregular fever, with chills and sweating; splenic tumor; 19,000 leukocytes; no petechiæ. There was a general systolic murmur. No autopsy.

CASE XV.—Aged twenty-nine years, female; scarlet fever as a child, with attacks of cardiac palpitation, dyspnœa, and œdema following. Temperature high and continuous; splenic tumor; cutaneous hemorrhages; leukocytes, 23,000; trace of albumin, and a few hyaline and granular casts. Systolic and presystolic mitral murmurs.

Autopsy showed mitral valve greatly stenosed; aortic valve greatly stenosed, with one cusp perforated; infarcts of the lung.

CASE XVI.—Aged forty-one years, male; old malarial history, with gonorrhœa and cystitis. Irregular fever, with chills and œdema of extremities; no spleen; no hemorrhages; urine contained 10 per cent. of albumin, hyaline, and granular casts. There was a mitral systolic murmur.

Autopsy revealed enormous vegetations on the mitral valve; infarcts of the heart, liver, and spleen.

CASE XVII.—Aged twenty-six years, male; old rheumatic history, alcoholic, with gonorrhœa. Ill three months with previous endocarditis. Temperature irregular, with splenic enlargement and cutaneous hemorrhages. Mitral, systolic, and double aortic murmurs.

On *autopsy* the mitral valve was thickened and retracted; the aortic eroded and calcareous; pericardium adherent. Infarcts of the spleen.

CASE XVIII.—Aged twenty-six years, male; rheumatic, alcoholic, gonorrhœal, and specific history. For eight days headache, diarrhœa, high, continuous temperature, splenic enlargement, and cutaneous hemorrhages. The urine contained 10 per cent. of albumin, hyaline, and granular casts. There was a mitral systolic murmur.

Autopsy revealed vegetations on both mitral and aortic valves, and infarcts of the kidney.

CASE XIX.—Aged forty-three years, female. Sudden onset, with chill, fever, diarrhœa, hemiplegia; temperature was continuously high; chill was not repeated; no splenic enlargement; no hemorrhages. Mitral systolic murmur.

Autopsy. Mitral valve thickened and retracted; infarcts of spleen and kidney.

CASE XX.—Patient was in coma when admitted; temperature 104.5°; no physical signs could be made out.

Autopsy revealed a large ulceration of the mitral valve.

CASE XXI.—Female. Former attacks of grippe and malaria. Upon admission there was swelling of the joints, fever, and coma. There were petechial hemorrhages, but no spleen; the urine showed 15 per cent. albumin, hyaline, and granular casts. No physical signs.

Autopsy showed thickening of the mitral valve and infarcts of the spleen and kidneys.

CASE XXII.—Aged twenty-eight years, male. For two weeks had rheumatic pains, dyspnœa, and slight temperature; splenic enlargement; double aortic murmurs.

Autopsy showed ulceration and vegetations on the aortic valve; infarct of the spleen.

CASE XXIII.—Aged twenty-eight years, female. Rheumatism with dyspnœa and cardiac palpitation for two months; temperature irregular; splenic tumor and hemorrhages; mitral systolic and aortic systolic murmurs.

Upon autopsy, vegetations upon the mitral valve and infarcts of the spleen and kidneys were found.

CASE XXIV.—Aged twenty-four years, female. History of scarlet fever and diphtheria. Sudden onset of muscular pain, with irregular temperature, chills, and petechial eruption; albumin, 2 per cent. Mitral systolic murmur with a diastolic at base of the heart.

Autopsy showed vegetations on pulmonary valve, with perforation. Infarcts of spleen and kidney.

CASE XXV.—Aged thirty years, female. Rheumatism starting with a chill, followed by fever and sweating; temperature continued high and irregular; splenic enlargement; 15,000 leukocytes; slight evidence of nephritis, and a mitral systolic murmur.

CASE XXVI.—Aged forty-three years, female. For three months dyspnœa and œdema from a former rheumatic attack. Temperature high and irregular; leukocytes, 11,400; cutaneous hemorrhages and mitral systolic murmur.

CASE XXVII.—Aged forty-eight years, male. Rheumatic attack of seven weeks' standing; temperature irregular, with chills, spleen, cutaneous bleeding, and 16,500 leukocytes. Albumin, 20 per cent.; large hyaline and granular casts. Mitral, systolic, and aortic diastolic murmurs.

CASE XXVIII.—Aged thirty-three years, female. Sudden joint pains with vomiting and headache. Temperature irregular; splenic enlargement; leukocytes, 17,000; mitral systolic murmur.

CASE XXIX.—Aged thirty-four years, male. Sudden onset with general pains, vomiting, chill, and sweating. Continuous fever, spleen, and petechiæ; 6000 leukocytes; mitral systolic murmur.

CASE XXX.—Aged thirty-four years, male. Two months' duration, with headache and delirium. Continuous temperature, petechial hemorrhages, and mitral systolic murmur.

CASE XXXI.—Culture gave staphylococcus pyogenes albus.

Autopsy showed vegetations of aortic valve and atheroma of the coronary arteries, infarcts of the spleen, petechial hemorrhages in all the viscera.

CASE XXXII.—Aged thirty-one years, female. Sudden illness, with diarrhœa and headache; spleen, petechial hemorrhages, low and irregular temperature; 22,000 leukocytes; staphylococcus pyogenes albus were found upon culture.

RECAPITULATION.

From the accompanying cases it is evident that symptomatically there are a number of types of the disease.

One of sudden onset, short duration, with high continuous temperature, headache, splenic enlargement, cutaneous hemorrhages or bleeding from the mucous membranes, together with evidence of inflammation of the endocardium; here the endocarditis is but one manifestation of a severe general infection which rapidly goes on to a fatal termination.

The second form is of much longer duration, persisting for weeks, or sometimes for months, beginning gradually with irregular fever, which often becomes remittent or even intermittent, and may be accompanied by chills and sweating, gradual loss of flesh and strength; splenic tumor, hemorrhagic eruptions, abscesses, and endocarditis. This form is distinctly septic or pyæmic in its action, and presents an entirely different picture from the former.

A third class is one in which the chief factor is meningitis. Here we see signs of intense cerebral irritation, with the addition of endocarditis, enlargement of the spleen, petechial hemorrhages, septic infarctions, and often pneumonia.

Still a fourth variety is one in which the local endocardial signs and symptoms are of chief prominence, the constitutional affection being slight, except for the evidence of poor circulation.

The foregoing varieties are recognized by most authorities under the names of typhoid, septic or pyæmic, cerebral, and cardiac types, respectively, according to the predominance of the various symptoms.

There can, however, be no certain deductions drawn as to the variety of organisms causing the different clinical forms, for the conditions simulate one another too closely.

As examples of the typhoid form there are two of staphylococcus, one of streptococcus, and one of micrococcus lanceolatus infection (Cases II., III., X. and VII.).

As examples of the septic class of long duration there are 1 of streptococcus, 2 of pneumococcus, and 2 of staphylococcus infection (Cases IX., V., VI., I., and IV., respectively).

Of 3 cases of meningitis, 1 was of staphylococcus origin, 1 of mixed staphylococcus and pneumococcus origin, and 1 was of pure pneumococcus infection.

In 2 cases of pneumococcus infection there was neither pneumonia nor meningitis present.

The *endocarditis* is a pre-existing factor in most of the cases. There are instances, however, where there is no reason to suspect that a previous inflammation of the endocardium existed. We find cases where cardiac murmurs develop during the course of the disease, in which no abnormal condition existed in the heart at the first examination. There are also numerous cases of ulcerative endocarditis, which run their course without giving any signs which would call one's attention to the heart. These are difficult of diagnosis.

In 19 of the 32 cases, the cardiac signs found upon physical examination were verified by post-mortem findings. They were mitral, 7 cases; aortic, 3 cases; mitral and aortic together, 6 cases; pulmonary, 1 case; mitral, aortic, tricuspid, and pulmonary together, 1 case; these cases also showed affection of the heart wall in 1, adherent pericardium in 1, and sclerosis of the coronary arteries in 2.

While the greater number of murmurs represent lesions of the mitral and aortic valves, we must bear in mind that in malignant endocarditis more than in the simple form of the disease, we find evidence of endocarditis of the right heart, affecting the tricuspid and pulmonary valves.

Culture. In 24 cases from which blood was taken for culture, growths were obtained in 12. Cultures taken from the viscera of these cases which came to autopsy showed the same findings, and in no instance did the two results differ. One case showed pyogenic organisms taken from the viscera in which no blood specimen was taken. There were staphylococcus pyogenes aureus, 4; streptococcus pyogenes, 2; micrococcus lanceolatus, 3 cases; pneumococcus and streptococcus together, 1 case.

The cultures were all grown in bouillon or blood serum media. Bouillon is used exclusively now, and the best results are obtained from high dilutions.

The method of blood taking is as follows: Under strict antiseptic precautions a needle is introduced into the median basilic vein and about 10 c.c. of blood withdrawn. The needle is of fairly large calibre, and is attached to a glass tube holding 10 c.c., into which the blood runs of its own accord. The whole instrument when not in use is kept clean in a larger sterilized tube.

The culture tube is a large test tube holding about 50 c.c. of bouillon. To prevent contamination a piece of sterile gauze is placed over it, and on this a wire gauze which dips for about one inch into the test tube and is bent over the edges; over this again the cotton plug is inserted. Thus the plug can be removed without exposing the surface of the culture medium.

After the needle tube has been filled with blood 3 or 4 c.c. are expressed into the culture tube or flask—preferably the former—holding 50 c.c. of bouillon. Three such culture tubes are made.

The *temperature* may rise suddenly and remain continuously high, without remissions, until death ensues. This course of temperature is generally indicative of a severe infection of short course, and is unaccompanied by chills. It simulates closely the curve of typhoid fever, and is often the cause of mistaken diagnosis.

The temperature is frequently irregular, may be low or high, accompanied by remissions or frequently by intermissions, sometimes occurring daily, so that there is a daily rise and fall of five or six degrees. These marked remissions are often accompanied by chills and profuse sweats.

The irregular type of temperature accompanies the cases of considerable standing, although occasionally they are of but short duration.

The *blood* examination shows an increase in leukocytes in all of the cases; those of high continuous temperature being (with but one exception) over 15,000 per c.mm., and frequently 20,000, 25,000, or 30,000 per c.mm. A count of less than 15,000 per c.mm. belongs to the irregular and protracted group, although occasionally a member of this class exceeds that figure.

In Jackson's series of 59 cases he found the leukocytes regularly increased from 16,000 to 20,000 per c.mm. This increase does not hold in my series of cases, for I distinctly find in the septic varieties that the leukocytes are almost invariably below 15,000 per c.mm., and frequently below 12,000 or even 10,000 per c.mm. According to Babcock (*Diseases of the Heart*) leukocytosis is the rule; but where septicæmia exists, and there is but slight increase in the leukocytes or none at all, malignant endocarditis is to be suspected. The red blood cells and hæmoglobin show the changes of secondary anæmia.

Emboli are of frequent occurrence, but vary greatly as to the seriousness of their results. When occurring in the cerebral arteries, coronary arteries, or lungs they may be quickly fatal. They occur, however, most frequently in the spleen and kidneys. The lodging of an embolus is accompanied by sudden, sharp pain in the part affected, together with a rise of temperature and frequently a chill. Such an infarct is not infrequently followed by death of tissue and abscess, thus forming a new focus of infection. Among our nineteen autopsies there were sixteen showing emboli—one in the brain, two in the lung, one of the heart muscle, the others occurring in the spleen and the kidneys, together with one in the liver.

Hemorrhages occurred in 16 of the 32 cases enumerated here, the bleeding being mostly in small pinhead spots of the petechial variety, occurring in successive crops; in a few instances, however, larger ecchymoses were to be seen. Bleeding from the mucous membranes occurs, usually as epistaxis; less frequently we find hemorrhage from the lungs, from the kidneys, or into the brain.

In our collection there were 3 cases of hemiplegia; of these 1 was of staphylococcus origin, and 2 of pneumococcus origin.

Splenic enlargement occurred in about half of the cases cited here, with greater frequency, however, in the prolonged ones; palpation of the spleen often elicits pain from congestion or as the result of previous infarction.

Nervous Symptoms. In many cases apathy precedes delirium, which is of an active character, or is low and muttering; the active delirium occurs in cases of severe general infection of the typhoid type, while mutterings and hallucinations take place in the prolonged disease of septic type. Convulsions, coma, or death may occur at any time from embolism or hemorrhage of one of the cerebral arteries. With meningitis added, the nervous symptoms take on a more severe aspect, with cerebral irritability, convulsions, stupor, or coma; retraction of the head and neck; dilated pupils, which do not react; photophobia and strabismus; excessive hyperæsthesia; marked rigidity of the muscles of the back and extremities; opisthotonos, etc.

The pulmonary symptoms are those accompanying any severe endocarditis, and are caused by venous congestion of the lungs and insufficient oxygenation of the blood; they are evidenced by cyanosis, dyspnœa, cough, mucopurulent expectoration; moist rales may be heard in the dependent portion of the chest. With pulmonary infarct we have sharp pain, sudden dyspnœa, and hæmoptysis. In case death does not ensue, evidence of consolidation follows with, perhaps, pleuritic effusion or empyema. Where pneumonia occurs its characteristic signs are added to the above.

The *urine* generally contains a trace of albumin, with a few hyaline and granular casts; a few cases show a marked nephritis, possibly independent in origin, possibly due to the irritation of the tubules by circulating bacteria or toxins, or from infarctions; in 2 cases there was a considerable quantity of blood in the urine. Where emboli occur, with softening and abscess, pyuria results.

Concerning the use of antistreptococcus serum I have collected from the literature 24 cases; 7 have resulted in recovery, and 17 have died. In some the recovery seemed to follow the injection of the serum; in others the injection apparently did no good, or did decided harm. Beneficial results have been obtained in enough cases to warrant its receiving a more thorough trial.

SUMMARY.

1. Malignant endocarditis is a disease of bacterial origin; it differs from single acute endocarditis in the extent of endocardial inflammation and tissue necrosis; in the fact that the right heart is more often attacked; in the more frequent embolic processes which are septic in character. Micro-organisms are found in the blood during life, in the emboli, and on the heart valves after death.

2. There is nothing in the clinical appearance distinctive of any particular variety of germ causing it.

3. Primary cases are rare, though they do exist; most cases, however, accompany rheumatism, septicæmia, the acute infectious diseases, or are engrafted upon an old endocarditis.

4. Almost all are fatal; the ones due to severe infection in a few days; the septic ones in a few weeks. The first variety have a leukocytosis of 15,000 or over, the latter usually below that number, some being very slight.

5. Emboli and hemorrhages are of frequent occurrence, and may be fatal in their results.

6. The urine usually shows evidence of nephritis; it may contain blood and pus from hemorrhage or infarct.

7. Treatment is usually unavailing, excepting the serum therapy, which is of uncertain value.

8. Infants and young children seem to be almost exempt from the disease.

The thirty-two cases cited here were published at greater length in the *Report of the Presbyterian Hospital* (New York) for 1904; they occurred in the hospital during the past ten years.

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ANGIONEUROTIC ŒDEMA.

REPORT OF TWO CASES WITH THE HISTOLOGY OF A PORTION OF THE GASTRIC MUCOSA OBTAINED BY THE STOMACH-TUBE.

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IN recent years considerable attention has been given to a disease which was first described accurately in 1882 by Quincke,[1] who gave to it the name "acute circumscribed œdema of the skin." Strübing,[2] an early student of this disease, proposed "angioneurotic